Go in the Opposite Direction? The Impact of Unavailability on Crowdfunding Success

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Abstract. Reward-based crowdfunding are increasingly playing an important role in raising financial capital for small projects. The most important goal for creators on the platform is to successfully raise enough capital for their projects. Our study aims to provide a new angle to understand backer's decision-making process on pledging behavior by uncovering how different dimensions of unavailability influence crowdfunding success. By analyzing more than 400,000 projects on Kickstarter, we find that time-based unavailability can indeed improve the possibility of success while quantity-based unavailability has negative impacts. Besides, each dimension of unavailability can influence how individuals interpret other dimension of unavailability by changing the way how individuals receive and process persuasive information.

Keywords: Crowdfunding · Scarcity · Decision making · Heuristic-Systematic model · Information asymmetry

1 Introduction

1.1 A Subsection Sample

The rapid advancement of information technology has spawned a number of FinTech revolutions, such as crowdfunding, social investing, social lending, mobile payment, blockchain, digital currency, algorithm trading, etc. Mollick (2014) defines crowdfunding as "the efforts by entrepreneurial individuals and groups – cultural, social, and for-profit – to fund their ventures by drawing on relatively small contributions from a relatively large number of individuals using the internet, without standard financial intermediaries." Models of crowdfunding becomes stable after several years' development. Generally speaking, there are four types—donation-based model, lending-based model, reward-based model, and equity-based model—classified according to the "reward" (Belleflamme, Lambert, and Schwienbacher 2014).

This study focuses on reward-based crowdfunding, which has become a nonnegligible alternative for entrepreneurs to raise financial capital. As of August 2019, the leading reward-based crowdfunding platform in the world, Kickstarter, has already raised 4.5 billion US dollars for more than 169,000 successful projects[1]. Naturally, the determinants of success of raising capital attract oceans of attention from both practitioners and

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[1] https://www.kickstarter.com/help/stats (accessed August 2019)

researchers (Burtch, Ghose, and Wattal 2014; Hong, Hu and Burtch 2018; Li and Wang 2019; Lin, Prabhala, and Viswanathan 2013; D. Liu, Brass, Lu, and Chen 2015; Xu and Chau 2018; Younkin and Kuppuswamy 2017). Although considerable progress has been made, explanations from different theoretical perspective remain indispensable.

Our study investigates the effect of "unavailability" on project success, which is seemingly opposite to previous literature. In the context of crowdfunding, we define unavailability as the explicit constraints to back a project. To further elaborate the influence of unavailability, we do not treat unavailability as a unitary construct, but separate the unavailability construct into two different dimensions—quantity-based unavailability, and time-based unavailability. Quantity-based unavailability refers to the constraints that restrict the total number of backers who are allowed to pledge for certain reward in a project. Those rewards are backed according to the first-come-first-served rule. Time-based unavailability refers to the constraints that restrict the time period during which backers can pledge for the project.

To facilitate more precise understanding of the two definitions, we use two real projects on Kickstarter as the example, one named "The World's Warmest NECK GAITER with Stash Pocket" (noted as project A)[2] and the other named "EcoQube-Desktop Ecosystem That Grows Flowers and Herbs" (noted as project B)[3]. Project A has 8 rewards to choose and 2 of them limit the total number of backers allowed to pledge while project B has 11 rewards to choose and 4 of them limit the total number of backers allowed to pledge. Quantity-based unavailability is built on the percentage of rewards which limit the total number of backers to pledge. Thus, quantity-based unavailability should be higher for project B than project A (4/11 is larger than 2/8). A higher percentage of rewards with quantity limit of backers represents higher quantity-based unavailability.

Time-based unavailability is built on the length of funding period. Project A is allowed to pledge from Nov 12, 2015 to Dec 12, 2015, 30 days in total, while project B is allowed to pledge from Dec 1, 2013 to Jan 12, 2014, 42 days in total, so the time-based unavailability should be higher for project A than project B. Shorter funding period represents higher time-based unavailability.

Furthermore, the two dimensions do not necessarily have the same impact, or their impacts share the same underlying mechanisms, so we also investigate their interacting effect. One of the most salient characteristics of crowdfunding is that it lowers the threshold for anyone to start a project and invest in a project. However, we claim that the unavailability of the projects is indeed able to enhance the possibility of crowdfunding success. Our argument is built on commodity theory (Brock 1968) and the heuristic-systematic model explaining how individuals process persuasive information (Chaiken 1980).

Our paper has two major contributions. First, it contributes to the large stream of literature on unavailability (Cachon, Gallino, and Olivares 2018; Cui, Zhang and Bassamboo 2018; Kremer and Debo 2015; Q. Liu and Van Ryzin 2008; Lynn 1991; Stock and

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[2] https://www.kickstarter.com/projects/1983290420/the-worlds-warmest-neck-gaiter-with-stash-pocket (accessed August 2019)

[3] https://www.kickstarter.com/projects/kevinzl/ecoqube-desktop-ecosystem-that-grow-flowers-and-he (accessed August 2019)

Balachander 2005), which demonstrates that individuals interpret different dimensions of unavailability differently. Our research extends this stream of study by identifying that individuals believe time-based unavailability to be reliable and authentic signals for internal project quality, but they consider quantity-based unavailability skeptically. Furthermore, we show that time-based unavailability and quantity-based unavailability can jointly influence crowdfunding success, indicating that time-based unavailability can influence how individuals interpret quantity-based unavailability.

Second, our study adds to the large body of work on backer's decision making in reward-based crowdfunding (Colombo, Franzoni and Rossi–Lamastra 2015; Dai and Zhang 2019; Li and Wang 2019). Backers in online crowdfunding platform exhibit different behaviors under different dimensions of unavailability. The effect of unavailability is delivered though influencing how individuals receive and process persuasive messages. Time-based unavailability induces individuals to rely on heuristic cues to infer internal quality while quantity-based unavailability is only perceived to be sales tactics. Our further analysis provides evidence that combining the two dimensions of unavailability can amplify the positive impact on crowdfunding success.

2   Literature Review and Hypothesis Development

2.1   Theoretical Background Theoretical Background

Our study is closely related to the unavailability literature which roots in commodity theory (Brock 1968). Scarcity has huge psychological power because individuals treat it as the heuristic cue for value (Cialdini 2007). Unlike previous studies which usually focus on one dimension of unavailability, we systematically investigate how each dimension of unavailability influences on crowdfunding success and their interacting effect. In addition, our study relates to the large volume of literature concerning the factors influencing investors' decision making on crowdfunding platforms. A number of factors are identified to exert significant impact, such as geographic distance (Agrawal, Catalini and Goldfarb 2015; Burtch et al. 2014; Lin and Viswanathan 2015), communication (Xu and Chau 2018), cultural differences (Burtch et al. 2014), founder's race (Younkin and Kuppuswamy 2017), and project prosociality (Dai and Zhang 2019; Li and Wang 2019). Different facets of social capital also matter, such as, friendship (Lin et al. 2013; D. Liu et al. 2015), social networks (Lukkarinen, Teich, Wallenius, & Wallenius, 2016), embeddedness (Hong et al. 2018), and reciprocity (Colombo et al. 2015).

2.2   Quantity-Based Unavailability and Crowdfunding Success

Quantity-based unavailability refers to the constraints that restrict the total number of certain rewards or products. It is generally shown to increase the perceived value (Lynn 1991) with evidence from a wide range of products as well as in a broad range of situations. These products include but are not limited to cookies (Worchel, Lee and Adewole 1975), books (Verhallen and Robben 1994), wines (Van Herpen, Pieters and Zeelenberg 2009), and automobiles (Cachon et al. 2018). Besides, the effect that quantity-based enhances value remain robust even when individuals are suffering from financial constraints (Sharma and Alter 2012). Prior researchers identify numerous mechanisms disclosing the association between quantity-based unavailability and increased value,

such as the need for uniqueness (Fromkin and Snyder 1980), psychological reactance (Clee and Wicklund 1980), and naïve economic inferences (Lynn 1992).

Contrary to prior studies, we argue that prior old offline conclusion cannot be generalized to online context. The theory most cited by prior studies is come up with in 1984. At that year, less than 10% of US households had a computer and none of them had internet, not to say other countries. The shift from offline context to online context changes the cognitive and affective processes which establish the effect of offline quantity-based unavailability. In detail, the premise of quantity-based unavailability to be effective is that potential backers believe the signal of quantity-based unavailability is true. This premise is hardly held on online crowdfunding platform because of the high information asymmetry. Potential backers are naturally skeptical of costless signal of value. Unlike time-based unavailability which greatly threatens the success of crowdfunding, quantity-based unavailability does not bring such risk. There are two reasons. First, most of the projects offer very high upper bound which are seldom filled up. Second, most of the projects provide many categories of rewards. Thus, before the quantity limitation is reached, the funding goal has been reached, which indeed brings no failing risk. Frivolous overuse of quantity-based unavailability claims reinforces backers' suspicion of the authenticity of these signals. Thus, without other costly as well as reliable signal, the effect of quantity-based unavailability should be negative and we hypothesize that,

H1: Quantity-based unavailability is associated with lower possibility of funding success.

2.3   Time-Based Unavailability and Crowdfunding Success

Time-based unavailability refers to the constraints that restrict the time period when certain rewards or products can be obtained, which may motivate potential backers to pledge through three mechanisms. First, prospect theory suggests that individuals are naturally loss aversion because they have a "value function" which is positive as well as concave over gains while is negative, convex, and more steeply sloped over losses (Kahneman and Tversky 1979). Shorter funding duration increase the possibility that potential backers lose the opportunity to get rewards permanently if they do not pledge before deadline. Since individuals are more sensitive to loss, the framing of missing deadline as permanent loss increases the likelihood for individuals to pledge. Specifically, the increased likelihood should be a function of individuals framing a reward initially as a potential gain and then reframing it as a permanent loss once the potential backers process the deadline information.

Second, regret theory also sheds light on how time-based unavailability influences pledge intention. Promotions with time limitation are found to accelerate purchase more than promotions without time limitation, and besides, purchase intention is shown to increase dramatically as deadline approaches (Aggarwal and Vaidyanathan 2003; Inman and McAlister 1994). Similarly, as the deadline of a project approaches, potential backers may feel impending regret about the rewards they are losing if they do not pledge. The fact that potential backers will miss the reward forever creates the perception of time-based

unavailability, and it induces pledge action by taking advantage of potential backers' fear of "missing" (Cialdini 2007). The regret effect is particularly salient in the context of crowdfunding because projects introduce new products to the market and individuals can hardly find the same product or substitute after they miss the chance to pledge.

Third, time-based unavailability motivates individuals to take risk. Under time pressure, the attractiveness of risky choice increase (Young, Goodie, Hall and Wu 2012). What's more, with shorter time period to make a decision, individuals have to process information faster and thus prefer the riskier choice (Chandler and Pronin 2012). The risk of pledge is higher than nonpledge because no matter the expected utility of nonpledge is positive or negative, the value should be a fixed number while the expected utility of pledge changes according to the progress as well as the outcome of the project.

Last but not least, time-based unavailability is a costly signal for creators. Creators take more risk to shorten the funding period because shorter funding period means fewer potential backers can notice the focal project and thus fewer backers can pledge. Only if creators are very confident about the quality of their project and believe their project can attract enough funding in a relatively short time, they dare to shorten the funding period. Otherwise, their project will fail, and creators cannot get any fund. Therefore, backers tend to believe the time-based unavailability can signal the real inherent quality. Based on the arguments above we hypothesize that,

H2: Time-based unavailability is positively associated with crowdfunding success.

2.4   Interacting Effect of Time-Based Unavailability and Quantity-Based Unavailability

Time-based unavailability can also alter how individuals interpret quantity-based unavailability. As mentioned before, single quantity-based unavailability has already been interpreted as sales tactics, which may not attract potential backers. However, if quantity-based unavailability is accompanied by the time-based unavailability, potential backers will change their interpretation. Time-based unavailability brings great risk for creators to raise capital because some crowdsourcing platforms such as Kickstarter use the all-or-nothing rule. If project creators do not raise enough funds to meet the funding goal, they will get nothing. Projects with higher time-based unavailability should have higher internal quality so when the quantity-based unavailability is also high, individuals will tend to believe the project is authentically scarce. Thus, we hypothesize that,

H3: The impact of time-based unavailability on crowdfunding success is stronger for projects with higher quantity-based unavailability.

3   Methods and Data

The platform we study in this research is Kickstarter, which maintains a global crowdfunding platform focused on creativity and merchandising. Kickstarter allows entrepreneurs to create projects on the web and attract backers to invest for the promised

rewards listed in the main page of the focal project. For the project itself, entrepreneurs can write in plain text to describe their project and also upload pictures as well as videos to provide a more vivid blueprint. In the description part, entrepreneurs can design a reward system that explains how much investments correspond to what rewards and how long the backers can receive the rewards. Even though the description of a project is given in detail, it is still impossible for either the Kickstarter platform or the individual backers to quantify the quality of a project. Thus, potential backers tend to further rely the background information of the creator (the entrepreneurs) of the project. Creators have the autonomy to disclose their social network accounts, such as, Facebook, Twitter, and Instagram and other websites related to the project or themselves. Backers can, therefore, get more information to access both the capabilities and the motivation of the focal creators to realize the projects. Besides, Kickstarter also discloses the backing history and creating history of the focal creator. Backers can easily know how many projects the creator back and create on the platform. To provide a direct channel for creators and backers communicate, Kickstarter offer the comment section for each project webpage where backers can make comments and request more information about the project and the creator can decide which comment to respond and how to respond.

We crawl the information of more than 400,000 projects by more than 330,000 creators on the Kickstarter platform from 2009 to 2019. Our sample size is close to the official number of all projects on Kickstarter (Kickstarter, 2019). The missing projects are those whose project information is deleted by creators or Kickstarter platform.

Fig. 1. An example on quantity-based unavailability and time-based unavailability

Figure 1 gives an example on quantity-based unavailability and time-based unavailability[4]. We measure quantity-based unavailability as the number of reward categories with quantity limit and then divided by total number of reward categories and funding period is related to the time-based unavailability. Except for percentage variables and dummy variables, all other variables are log-transformed to get a more normalized distribution (Table 1).

Table 1. Explanation of variables

Variable names	Explanations
Dependent variables	
Success	1 if the project is fully funded and 0 otherwise
Independent variables	
Quantity-based unavailability	The percentage of rewards category with quantity constraints
Time-based unavailability	The length of funding period in days multiplied by −1 (a larger number represents higher unavailability)
Control variables	
Number of words	The number of words the creator uses to describe the project
Number of pictures	The number of pictures the creator uses to describe the project
Number of videos	The number of videos the creator uses to describe the project
Funding goal	The funding goal of the project (USD)
Staff pick	1 if the project is recommended by the Kickstarter staff and 0 otherwise
Number of total websites	The number of external websites disclosed by the creator
Number of collaborators	The number of collaborators in the project
Number of projects backed	The number of projects the creator has backed on Kickstarter
Number of projects created	The number of projects the creator has created on Kickstarter
Number of pre-launch total comments	The number of comments made by backers before the deadline of the fundraising period
Number of reward categories	The number of choices the creator provides for the backers to invest
Estimated days to deliver	The estimated days to deliver rewards from the deadline of the fundraising period

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[4] https://www.kickstarter.com/projects/cavinbounce/lights-coma-action (accessed August 2019).

From Table 2, we can see that the success rate in our sample is 38%.

Table 2. Descriptive statistics

Variables	Mean	S.D.
Success	0.38	0.49
Time-based unavailability	−3.50	0.37
Quantity-based unavailability	0.39	0.37
Number of words	6.18	0.97
Number of pictures	1.90	0.83
Number of videos	0.52	0.37
Funding goal	8.63	1.68
Staff pick	0.060	0.24
Number of total websites	1.54	1.59
Number of collaborators	0.060	0.24
Number of projects backed	0.92	1.22
Number of pre-launch comments	0.74	1.27
Number of reward categories	2.00	0.62
Estimated days to deliver	4.03	1.92

4   Results

In the empirical testing part, we use the Logit regression model and include year fixed effect and project category fixed effect. The variable "Time-based # Quantity-based" represents the interacting effect. The results are shown in Table 3. Basically, all our three hypotheses are supported.

Table 3. Regression results

Variables	Success	Success
Quantity-based unavailability	−0.203***	0.602***
	(0.014)	(0.115)
Time-based unavailability	0.526***	0.446***
	(0.013)	(0.017)
Time-based # Quantity-based		0.233***
		(0.033)
Number of words	0.023***	0.023***

(*continued*)

Table 3. (*continued*)

Variables	Success	Success
	(0.007)	(0.007)
Number of pictures	1.157***	1.158***
	(0.010)	(0.010)
Number of videos	0.348***	0.348***
	(0.015)	(0.015)
Funding goal	−0.813***	−0.813***
	(0.004)	(0.004)
Staff pick	0.997***	0.997***
	(0.019)	(0.019)
Number of total websites	0.054***	0.054***
	(0.003)	(0.003)
Number of collaborators	0.689***	0.691***
	(0.022)	(0.022)
Number of projects backed	0.369***	0.369***
	(0.004)	(0.004)
Number of pre-launch total comments	0.961***	0.962***
	(0.005)	(0.006)
Number of reward categories	0.624***	0.625***
	(0.011)	(0.011)
Estimated days to deliver	−0.021***	−0.021***
	(0.003)	(0.003)
Constant	2.995***	2.707***
	(0.155)	(0.160)
Observations	408,380	408,380
Project country location fixed effect	YES	YES
Launched year fixed effect	YES	YES
Project category fixed effect	YES	YES
Pseudo R2	43.73	43.74

5 Limitations and Concluding Remarks

Our paper is subject to several limitations. First, the endogeneity hampers the valid-ity of the casual inference in our regression analysis. Because both the quantity-based unavailability and time-based unavailability are determined by the project creator, it is very likely that these two factors are inherently correlated with the attributes of the

project, for example, the quality of the project. Thus, the likelihood of success is affected. To address this concern, we are going to use multiple-step propensity score matching to keep the projects with different level of attributes comparable to each other. After matching, the heterogeneity stemming from the choice of project creator is mitigated. Second, measurement error may exist. For example, we measure the quantity-based unavailability as the percentage of rewards category with quantity constraints. Other measurements, such as, a dummy variable on whether there is any category with quantity constraints or, much more strictly, whether all the categories are with quantity constraints, may be considered. In the future work, we should consider different measurements for robustness check at different levels. Third, our sample still misses a portion of projects and there are some other rewarded-based crowdfunding platforms so we should try to collect more comprehensive samples to justify the generalizability. However, from the perspective of the Kickstarter platform, our sample is very close to the whole population. Besides, future research may incorporate experiment part to investigate more detailed underlying mechanisms. Our research facilitates further understanding of individuals' decision-making process on the online crowdfunding platform and at the same time identifies the boundary condition of unavailability to be effective. Our finding suggests that quantity-based unavailability (costless signal of quality) cannot attract potential backers but time-based unavailability (costly signal of quality) can. We also show that time-based unavailability can enhance the reliability of quantity-based signal by investigating the interacting terms.

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